

Application No.: 09/884,084
Amendment Dated: December 1, 2003
Reply to Office Action of: May 30, 2003

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1. (Currently Amended) A porous hollow fiber membrane obtained by ~~a method comprising a dry-wet spinning method or a wet spinning method from a spinning dope while using the following components:~~

a spinning dope containing a base polymer as a material for forming said porous hollow fiber membrane,

an additive for facilitating a phase separation of said spinning dope,

a solvent compatible with both, said base polymer and said additive, and

a mass of microparticles insoluble in said solvent, wherein said microparticles are uniformly dispersed in a liquid medium and have an average particle size within the range of 1 to 20 μm , and

a coagulating liquid for forming the hollow fiber membrane,

to obtain a spun hollow fiber membrane; and

~~preparing a spinning dope containing microparticles;~~

~~forming said hollow fiber membrane from said spinning dope according to a dry-wet spinning method or a wet spinning method to obtain a spun hollow fiber membrane; and~~

extracting and removing said additive and said microparticles by immersing said spun hollow fiber membrane into an extracting solution effective to dissolve said microparticles, but ineffective to dissolve said base polymer;

wherein said hollow fiber membrane has a permselectivity; wherein a particle cutoff is

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within the range of 1 to 10 μm ; and wherein a pure water permeate flow is equal to or higher than 30,000 L/m²/hr/100kPa.

2. (Previously Presented) The porous hollow fiber membrane as claimed in Claim 1, wherein said particle cutoff is within the range of 2 to 5 μm and said pure water permeate flow is equal to or higher than 100,000 L/m²/hr/100 kPa.

3. (Previously Presented) The porous hollow fiber membrane as claimed in Claim 1, wherein said porous hollow fiber membrane comprises a polysulfone material.

4. (Previously Presented) The porous hollow fiber membrane as claimed in Claim 3, wherein said porous hollow fiber membrane comprises a polysulfone material comprising 1 to 10 wt% of a hydrophilic polymer.

5. (Previously Presented) The porous hollow fiber membrane as claimed in Claim 4, wherein the hydrophilic polymer is a polyvinylalcohol polymer.

6. (Currently Amended) A method of making a porous hollow fiber membrane, comprising:

forming said hollow fiber membrane according to a dry-wet spinning method or a wet spinning method while using the following components:

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a spinning dope containing a base polymer as a material for forming said porous hollow fiber membrane,
an additive for facilitating a phase separation of said spinning dope,
a solvent compatible with both, said base polymer and said additive, and
a mass of microparticles insoluble in said solvent, wherein said microparticles are uniformly dispersed in a liquid medium and have an average particle size within the range of 1 to 20 μm , and
a coagulating liquid for forming the hollow fiber membrane,
to obtain a spun hollow fiber membrane; and
extracting and removing said additive and said microparticles by immersing said spun hollow fiber membrane into an extracting solution effective to dissolve said microparticles, but ineffective to dissolve said base polymer;
wherein said porous hollow fiber membrane has a permselectivity; wherein a particle cutoff is within the range of 1 to 10 μm ; and wherein a pure water permeate flow is equal to or higher than 30,000 L/m²/hr/100kPa.

7. (Previously Presented) The method of making the porous hollow fiber membrane as claimed in Claim 6, wherein the spinning dope is used in the form of a uniform spinning dope of a composition in which when only the base polymer, the additive and the solvent compatible to both the base polymer and the additive are dissolved, phase separation takes place, but addition of the microparticles suppresses the phase separation to enable spinning of

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the hollow fiber membrane.

8. (Previously Presented) The method of making the porous hollow fiber membrane as claimed in Claim 6, wherein said microparticles comprise silicon oxide.

9. (Previously Presented) The method of making the porous hollow fiber membrane as claimed in Claim 6, wherein said coagulating liquid for forming the hollow fiber membrane is a solution comprising 1 to 10 wt% of a polyvinyl alcohol.

10. (Withdrawn) A porous hollow fiber membrane module which comprises:
a plurality of porous hollow fiber membranes as claimed in Claim 1, each of the porous hollow fiber membranes having an effective length not greater than 50 cm, each or a block of the porous hollow fiber membranes being sealed at one end thereof;
a housing;
a protective casing; and
a bonding resin block accommodated within the housing and positioned at a lower end region of the housing while an end sealing region is positioned in an upper region of the housing when the module is in use.

11. (Withdrawn) A method of using porous the hollow fiber membrane as claimed in Claim 1 for preparing a purified water, comprising:

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filtering an untreated water from a water source through said porous hollow fiber membrane.

12. (Withdrawn) A method of using the porous hollow fiber membrane module as claimed in Claim 10 for preparing a purified water, comprising:

filtering an untreated water from a water source through said porous hollow fiber membrane module.

13. (Withdrawn) A method of using the porous hollow fiber membrane as claimed in Claim 1 for preparing a purified water, comprising:

coagulating an untreated water from a water source with a coagulating agent; and
subsequently filtering the water through said porous hollow fiber membrane.

14. (Withdrawn) A method of using the porous hollow fiber membrane module as claimed in Claim 10 for preparing a purified water, comprising:

coagulating an untreated water from a water source with a coagulating agent; and
subsequently filtering the water through said porous hollow fiber membrane module.

15. (Withdrawn) A method of using the porous hollow fiber membrane as claimed in Claim 1 for preparing a purified water, comprising:

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coagulating an untreated water from a water source with a coagulating agent;
subsequently subjecting the water to a sedimentation or a pressurized floatation
treatment to separate suspended particles from the water; and
filtering the water, from which the suspended particles have been separated, through
said porous hollow fiber membrane.

16. (Withdrawn) A method of using the porous hollow fiber membrane module as
claimed in Claim 10 for preparing a purified water, comprising:

coagulating an untreated water from a water source with a coagulating agent;
subsequently subjecting the water to a sedimentation or a pressurized floatation
treatment to separate suspended particles from the water; and
filtering the water, from which the suspended particles have been separated, through
said porous hollow fiber membrane module.

17. (Withdrawn) A method of using porous hollow fiber membrane as claimed in
Claim 1 for preparing a purified water, comprising:

coagulating an untreated water from a water source with a coagulating agent;
subsequently subjecting the water to a sedimentation or a pressurized floatation
treatment to separate suspended particles from the water;
filtering the water, from which the suspended particles have been separated, through a
sand filter, to obtain a sand-filtered water; and

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filtering the sand-filtered water through the porous hollow fiber membrane.

18. (Withdrawn) A method of using the porous hollow fiber membrane module as claimed in Claim 10 for preparing a purified water, comprising:

coagulating an untreated water from a water source with a coagulating agent;

subsequently subjecting the water to a sedimentation or a pressurized floatation treatment to separate suspended particles from the water;

filtering the water, from which the suspended particles have been separated, through a sand filter, to obtain a sand-filtered water; and

filtering the sand-filtered water through the porous hollow fiber membrane module.

19. (Withdrawn) A method of using porous hollow fiber membrane as claimed in Claim 1 for preparing a purified water, comprising:

filtering an untreated water from a water source through a sand filter to obtain a sand-filtered water; and

subsequently filtering the sand-filtered water through the porous hollow fiber membrane.

20. (Withdrawn) A method of using the porous hollow fiber membrane module as claimed in Claim 10 for preparing a purified water, comprising:

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filtering an untreated water from a water source through a sand filter to obtain a sand-filtered water; and

subsequently filtering the sand-filtered water through the porous hollow fiber membrane module.

21. (Withdrawn) A method of using porous hollow fiber membrane as claimed in Claim 1 for preparing a purified water, comprising:

coagulating an untreated water from a water source;

subsequently filtering the treated water through a sand filter to obtain a sand-filtered water; and

filtering the sand-filtered water through the porous hollow fiber membrane.

22. (Withdrawn) A method of using the porous hollow fiber membrane module as claimed in Claim 10 for preparing a purified water, comprising:

coagulating an untreated water from a water source;

subsequently filtering the treated water through a sand filter to obtain a sand-filtered water; and

filtering the sand-filtered water through the porous hollow fiber membrane module.

23. (Withdrawn) A method of using the porous hollow fiber membranes as claimed in Claim 1 for preparing a purified water, comprising:

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subjecting the water to at least one treatment selected from the group consisting of ozone treatment, activated carbon treatment and chlorine treatment, either before or after the filtration through the porous hollow fiber membrane.

24. (Withdrawn) A method of using the porous hollow fiber membrane module as claimed in Claim 10 for preparing a purified water, comprising:

subjecting the water to at least one treatment selected from the group consisting of ozone treatment, activated carbon treatment and chlorine treatment, either before or after the filtration through the porous hollow fiber membrane module.

25. (Withdrawn) The method of using the porous hollow fiber membrane as claimed in Claim 11, wherein the purified water is prepared by backwashing separation membranes at intervals of a predetermined time using a gaseous medium.

26. (Withdrawn) The method of using a porous hollow fiber membrane module as claimed in Claim 12, wherein the purified water is prepared by backwashing separation membranes at intervals of a predetermined time using a gaseous medium.

27. (Withdrawn) The method of using porous hollow fiber membrane as claimed in Claim 11, wherein the purified water is prepared by backwashing separation membranes at intervals of a predetermined time using a hot water of a temperature not lower than 60 °C.

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28. (Withdrawn) The method of using a porous hollow fiber membrane module as claimed in Claim 12, wherein the purified water is prepared by backwashing separation membranes at intervals of a predetermined time using a hot water of a temperature not lower than 60 °C.

29. (Previously Presented) The porous hollow fiber membrane according to Claim 1 having pores in the shape of circle or ellipse.

30. (Previously Presented) The porous hollow fiber membrane according to Claim 1 having a mesh structure, a honeycomb structure or a micro-interstice structure.

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BASIS FOR THE AMENDMENT

Claim 1 has been amended as supported by Claim 6 as originally filed. In addition, the amendment of Claims 1 and 6 is supported at page 11, last paragraph.

No new matter is believed to have been added by entry of this amendment. Entry and favorable reconsideration are respectfully requested.

Upon entry of this amendment Claims 1-30 will now be active in this application. Claims 10-28 stand rejected from further consideration.

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INTERVIEW SUMMARY

Applicants wish to thank Examiner Fortuna for her helpful and courteous discussion with Applicants' Representative on September 9, 2003. During this discussion it was proposed to amend Claim 1 and Claim 6 as shown in the Listing of Claims. In addition, the Examiner indicated that she would favorably consider the arguments regarding the influence of the additive on the pore size. Applicants submit herewith a Rule 132 Declaration showing the influence of an additive such as ethylene glycol on the pore size of the claimed membrane.